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Related Art :

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Complete Specification for the invention entitled :

"PRODUCTION OF WINES OR OTHER ALCOHOLIC DRINKS"

The following statement is a full description of this invention, including the best method of performing it known to me/us :

OS 20/5/76

This invention relates to the production of wines or other alcoholic drinks, and is particularly concerned with a process for the preparation of wines which have the "mature" characteristic flavour of French wines prepared from grapes. Such wines may be "still" wines or wines containing carbon dioxide so as to convert them into "pétillant" or "champagned" type wines.

According to the present invention, the materials used in making wines need not contain grapes or grape juice but are mixtures of much cheaper materials, namely materials comprising mixtures of common citrus fruit juices (e.g., juices of grapefruit, orange or other citrus juices) or certain other common inexpensive fruit juices (e.g. apple, pear, cherry or plum fruit juices or berry fruit juices such as blackberry, elderberry, bilberry, blueberry, blackcurrant and redcurrant juices), with extracts of malted barley (or other malted cereal), or of cereal or mixtures of starch and cereal-type substances, which have been wholly or partially converted by enzymic or acid hydrolysis to fermentable sugars, and preferably also with certain acidic substances and yeast nutrients. Inclusion of pectin-splitting enzymes in such mixtures is also desirable.

Fermentation of this mixture of basic materials, if desired, together with common household sugar (sucrose) or glucose (dextrose) or invert sugar or mixtures of any of these sugars may be achieved by a suitable yeast, such as a typical wine yeast or a brewer's yeast. Examples of suitable yeasts are Saccharomyces cerevisiae and Saccharomyces ellipsoideus.

To obtain wine of the desired flavour the fermentation is carried out in a vessel made of a film or membrane of material of the plastics class for example polyethylene. The material comprising the fermentation vessel is chosen so that the desired flavour in the end product is achieved. Certain plastics films achieve the desired flavour; others are less satisfactory. Choice of a satisfactory plastics film, together with the above mixture of starting materials and a desired yeast strain produce a finished wine having a satisfactory flavour.

British Patent Specification No. 1201183 describes a method of producing wine by carrying out the fermentation reaction in a disposable bag or sack made from a waterproof sterile material which does not impart flavour to the materials used in the fermentation or to the product of the fermentation and the neck of the bag or sack is sealed in a manner which prevents air (and hence infection) entering the bag from outside but allows gases produced by the fermentation (e.g. carbon dioxide) to escape from inside the bag. The fermentation process of the present invention may be carried out using the method described in British Patent Specification No. 1201183.

If the fermentation is carried out in a vessel made from unsuitable material (e.g, incorrect class of plastics material, glass or metal) wine of undesired flavour is produced. If fermentation is carried out in a vessel of the desired plastics

film, together with desired mixture of starting materials and a desired yeast strain, the fermentation can be carried out to completion so as to produce a wine having a moderate to high alcohol content say 5 to 14% alcohol W/V in about 5 to 21 days of fermentation at a suitable temperature (say 65° to 75°F).

Processes employed for making wines from juice of grapes by conventional methods usually employ methods which need several weeks for completion of the fermentation stage. The resulting wine then usually needs a period of storage before the wine is normally potable. By employing the processes of the present invention both fermentation and maturing periods are drastically shortened.

The process of the invention may be employed to produce "home-made" wine or commerical wines. In particular, a fermentation vessel of any desired shape or size may be used to produce a satisfactory wine having a desired flavour in a desirably short fermentation. To produce the wine required, the starting material should not contain too little or too much of the malt extract or its equivalent.

By choosing a plastics film of the correct class e.g. polyethylene, it is possible to allow oxygen from the air surrounding the fermenting vessel to gain access to the fermenting liquid by gaseous diffusion across the plastic membrane. Such oxygen is free from infecting micro-organisms, having been filtered by the plastics film.

The plastics material to be used is not limited to polyethylene. Any suitable plastics material which will allow oxygen to pass from the outside to the inside of the fermentation vessel to allow yeast growth may be used. Recent research in the yeast field has shown that certain strains of yeast may under some conditions, be grown without any requirement for an outside source of dissolved oxygen. Such yeasts require for example the addition to the medium of ergosterol together with unsaturated fatty acids; ergosterol dispersed in Tween 80 as a source of unsaturated fatty acids has been shown to promote yeast growth to a reasonable extent (paper of M.H. David and B.H. Kirsop, Journal Institute of Brewing, 1973 pages 20 to 25). Under these conditions suitable wines may be produced by fermenting in a plastics or other vessel which does not allow oxygen to gain access to the vessel's contents by diffusion.

The rate of diffusion of oxygen through a plastics layer is in inverse proportion to the thickness of the plastics material. Therefore any plastics film thickness is satisfactory but, for home brewing purposes a film which is thin enough to permit of rapid oxygen diffusion whilst being strong enough to withstand rough handling is required. In practice, a film of 50 microns (i.e. 50 thousands of 1 millimetre) has proved satisfactory ("50 Gauge"). Films of 500 microns thickness have been used and found to work satisfactorily apart from the fact that the heat seals on such bags are more difficult to make.

Thicknesses of 25 to 500 microns may be used for bags having a capacity of the order of 1 gallon. For larger bags correspondingly greater thicknesses can be used.

If the wines are made on an Industrial Scale the fermenting mixture from a container may be circulated by a pump through a series of plastic coils or vessels made from plastic films. The films would need to be of sufficient strength to stand up to the practical conditions. The vessels may be rigid and provided with air locks.

For optimum diffusion of oxygen through the plastics material, e.g. polyethylene it is preferred to use pure plastics i.e. plastics without additives such as fillers or plasticisers.

It is desirable if making wines of a lighter colour to use malt extract of as pale a colour as possible. There is a great range of colour variation in commercial malt extracts: darker malt extracts may be used for making a "golden" or "brown" wine (say, if a "dessert" wine is to be made); very pale malt extracts should be employed when preparing pale "white" wines.

Likewise, the colour and flavour of the wine may be influenced by the amount and type of malt extract employed. A pale white wine having a light flavour - "profile" may be prepared by using say 4 ounces per gallon of pale malt extract (or even lesser amounts). Alternatively, a heavily flavoured wine of a heavy colour is prepared by using say, 20 ounces per gallon of a dark - "heavy" malt.

The malt extract provides sources of mineral salts, assimilable nitrogen and of vitamin ("bios") substances, all of which are recuired by the yeast to produce rapid yeast growth which, in its turn, produces rapid fermentation. A similar effect may be obtained by adding to the wine constituents a range of "synthetic" chemical substances of the above nature which provide all the factors necessary for yeast growth and fermentation.

Dry malt extract can be used and the fruit juices may be provided in the form of dried powdered material. A complete dry pack is, therefore possible in practice.

The final wine can be made sparkling by a secondary fermentation after adding the desired amount of fermentable sugar, together with yeasts, in the well-understood "champagning" method. Alternatively, the wine may be carbonated by physical addition of carbon dioxide gas.

EXAMPLE 1

The essential equipment is a fermenter made from a film of polythene (or other suitable plastics material) which will allow diffusion of oxygen from the surrounding atmosphere to take place into the contents of the fermenter at a rate sufficient to effect the production of the desired flavour in the final wine. As an example, a bag 18 inches wide and 15 inches long, and fabricated from polythene film material of 25 to 500 microns thickness is satisfactory for this purpose; other films having satisfactory oxygen diffusion properties could be suitable for this purpose.

The bag is closed in the manner described in British Patent No. 1,201,183 so that a "vslve" type of closure is effected whereby carbon dioxide can safely escape from the vigorous fermentation which takes place in the fermenter but air from the outside of the bag (containing infecting micro-organisms, duct, insects, etc.) cannot gain entrance to the bag due to the effective action of the valve.

Oxygen from the air can, however, diffuse through the plastic film material into the fermenting contents at a desirable rate; such oxygen is, of course, free from infecting micro-organisms (or insects or dust), having been effectively filtered by the film structure.

Purely as one example of the preparation of the wine, 9 ounces of malt extract syrup of suitable quality is dissolved in boiling water, together with 3 pounds (48 ounces) of white sugar (or equivalent quantity of glucose or invert sugar) and 10 grams of citric acid. To this solution is added 28 fluid ounces of normal strength canned grapefruit juice or 7 fluid ounces of four-times concentrated grapefruit juice. Water is then added until the total volume is 1½ gallons (12 pints). The bulk is cooled to the desired temperature (say, 65°F to 75°F and the following are then added:-

Potassium phosphate (about)	14 grams
Ammonium sulphate (about)	28 grams
Tartaric acid (about)	14 grams

Tannin (about)	2 grams
Magnesium sulphate (about)	4 grams
Vitamin B.1. (about)	10 milligrams
Pectin-splitting enzyme Preparation –	sufficient to break down pectin in the fruit juice ingredients in order to prevent haze in the final, finished wine.

together with a living culture of a suitable yeast e.g. Saccharomyces cerevisiae or Saccharomyces ellipsoideus. Fermentation is allowed to develop and to continue at a suitable temperature until completed. The fermentation is completed when carbon dioxide gas-formation is finished and the yeast has sunk to the bottom of the fermentation mixture.

The crude wine is then removed from the fermenter bag by decantation or by syphoning, care being taken to discard as much of the sedimented yeast as possible.

The wine is clarified by filtration with, or without, the addition of suitable clarifying agents (e.g. kieselguhr, bentonite, paper pulp, asbestos pulp).

If desired, carbonation of the "still" wine formed in the above-manner may be produced by allowing a "secondary" yeast fermentation to take place by suitable addition of a small quantity of a desired fermentable sugar, together with a culture of suitable yeast. As an alternative, the clarified "still" wine may be carbonated by suitable mechanical addition of carbon dioxide gas under pressure by the standard and well-known procedures.

As a desirable variation of the above procedure, only two-thirds of the sugar is added at the beginning of the fermentation and the remaining third of the sugar may be added in one portion after, say, 48 hours of fermentation or in two portions, say, 48 hours and 96 hours after the commencement of fermentation.

The total amount of sugar added to the fermentation determines the alcohol content of the final wine and the total sugar additions can vary between about 40 ounces and 64 ounces to produce suitable wines.

The grapefruit juice as used in the above example can be replaced by orange, apple, pear or any other suitable fruit juices or mixtures of juices, as desired.

In addition to imparting a desirable authentic "French" grape wine flavour to the finished wine, a feature of the process is that the flavour of the wine is essentially that of a "mature" wine. Little or no maturing period, therefore, is necessary for this wine.

Example 2

The grapefruit juice of Example 1 is replaced by orange juice, either 28 fluid oz. of the normal strength orange juice or 4.66 fluid oz. of 6 times concentrated orange juice.

All other ingredients are as in Example 1. So also is the procedure.

Example 3.

In place of the grapefruit juice of Example 1, use a mixture of 50% grapefruit juice and 50% orange juice.

All other ingredients are as in Example 1. So also is the procedure.

Example 4.

In place of the grapefruit juice of Example 1, use a mixture of grapefruit juice and concentrated grape juice. One mixture is as follows:-

12 fl. oz. normal strength grapefruit juice

5 fl. oz. grape juice (4 times concentrated).

All other ingredients are as in Example 1. So also is the procedure.

Example 5.

In place of the grapefruit juice of Example 1, use a mixture of grapefruit juice and concentrated apple juice.

One mixture is as follows:-

12 fluid ounces normal strength grapefruit juice.

5 fluid ounces apple juice (4 times concentrated).

All other ingredients are as in Example 1. So also is the procedure.

Example 6.

In this example the malt extract used is increased to 20 ounces and the remainder of the ingredients and procedure are as in Example 1.

Example 7.

Malt Extract is reduced in this example to 4 ounces and all the remainder of the ingredients and procedure are as in Example 1, except that the following vitamins and mineral salts are added:-

Potassium lactate	4 grams.
D-Biotin	300 micrograms.
Calcium D-Pantothenate	15,000 micrograms.
Vitamin B_1 (Aneurin)	15,000 micrograms.

Example 8.

Fruit juice is used in the concentrated powdered form e.g. 3 ounces of powdered grapefruit juice solids. Malt extract is also added as a dried concentrate e.g. 7 ounces of powdered spray-dried malt extract solids. All other ingredients are as in Example 1. So also is the procedure.

All ingredients in this example are in the solid form and are packaged in airtight and watertight packages (e.g., plastic or glass bottles, plastic packets, etc.).

While the quantities used in the above Examples relate to wine making on a domestic scale, it will be appreciated that the Examples may be readily adapted to industrial or large scale manufacture of alocholic drinks.

It is desirable to emphasise that the addition to commercial grape juices of malt extracts or chemical materials which have a comparable effect - e.g. mineral salts plus a

source of assimilable nitrogen plus vitamins (see Example 7 above) will result in greatly increasing the rate of fermentation.

Similarly, an alcoholic drink of wine-like character may be prepared by fermenting a liquid containing fruit juices of various kinds (grape juice, orange, apple, grapefruit or any other fruit juice) to which is added a suitable quantitiy of a suitable grade of malt extract and (or) mineral salts or vitamin supplements e.g., ammonium phosphate, potassium lactate trace elements, biotin, calcium pantothenate, vitamir B_1 (aneurin), etc.

Industrially, this liquid is fermented with a large seeding rate of suitable yeast, preferably (but not essentially) passing the whole or a portion of the fermenting liquid through tubes, columns, or other suitable vessels made from polyethylene or polyethylene film until fermentation is complete. Short fermentation times are encompassed in this way, together with the effecting of rapid maturing of the alcoholic vine (or drink). For preference, (but not essentially) such drinks may be carbonated to give "sparkle"before consumption.

It will be appreciated that by employing these methods, the manufacturers of commercial wines and similar alcoholic drinks will be enabled to reduce the times required for fermentation and subsequent maturing processes. This will greatly reduce the investment required for plant, equipment and storage capacity in addition to enabling a factory of a stated size to handle a far greater volume of production.

The claims defining the invention are as follows:

1. A process for the preparation of wines or other alcoholic drinks which comprises fermenting with a yeast a mixture of at least one fruit juice and (a) an extract of malted cereal or (b) an extract of cereal or mixture of starch and cereal type substances which has been wholly or partially converted by enzymic or acid hydrolysis to fermentable sugars, the fermentation being carried out under conditions effective to promote yeast growth.

2. A process as claimed in claim 1 in which the yeast growth is promoted by the presence of oxygen substantially free from infecting micro-organisms.

3. A process as claimed in claim 2 in which the fermentation of the mixture is carried out in a substantially closed vessel made at least partly of a material of the plastics class through which oxygen from the air is able to diffuse into the fermenting mixture.

4. A process as claimed in claim 3 in which the vessel is a disposable bag or sack the neck of which is sealed in a manner which prevents air from entering the bag from outside other than by diffusion but allows gases produced by the fermentation to escape from inside the bag.

5. A process as claimed in claim 2, 3 or 4, in which the yeast is a wine yeast or a brewer's yeast.

6. A process as claimed in claim 2, 3 or 4 in which the yeast is Saccharomyces cerevisiae or Saccharomyces ellipsoideus.

7. A process as claimed in any one of claims 2 to 6 in which the fruit juice is grapefruit or orange juice.

8. A process as claimed in any one of claims 2 to 6 in which the fruit juice is apple, pear, cherry, plum, blackberry, elderberry, bilberry, blueberry, blackcurrant, or redcurrant juice.

9. A process as claimed in any one of claims 2 to 8 in which the mixture also contains acidic substances, yeast nutrients and/or pectin-splitting enzymes.

10. A process as claimed in any one of claims 2 to 9 in which the mixture also contains sucrose or glucose or invert sugar or a mixture of any of these sugars.

11. A process as claimed in any one of claims 2 to 10 in which the malted cereal is malted barley.

12. A process as claimed in any one of claims 3 to 11 in which the material of the plastics class is polyethylene.

13. A process as claimed in any one of claims 3 to 12 in which the wine produced is subjected to a gasification process.

14. A process as claimed in claim 13 in which the gasification is champagning, effected by a secondary fermentation.

15. A process as claimed in claim 13 in which the gasification is effected by carbonation.

16. A process as claimed in any one of the preceding claims in which instead of the extract of malted cereal its equivalent mineral salts, assimilable nitrogen and vitamin substances are used.

17. A process as claimed in any one of claims 1 to 3 in which the vessel is a substantially rigid container provided with air locks.

18. A process as claimed in any one of claims 1 to 3 or claim 17 in which the vessel includes tubes, columns or coils of material of the plastics class.

19. A process as claimed in claim 1 in which the mixture includes yeast growth promoters.

20. A process as claimed in claim 19 in which the promoters comprise a mixture of ergosterol and unsaturated fatty acids.

21. A process as claimed in any one of the preceding claims in which the fruit juice and malted cereal are initially in dried form.

22. A process for the preparation of wines substantially as hereinbefore described with reference to Example 1.

23. A process for the preparation of wines substantially as hereinbefore described with reference to any one of Examples 2 to 8.

24. Alcoholic drinks whenever prepared by the process claimed in any one of the preceding claims.

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